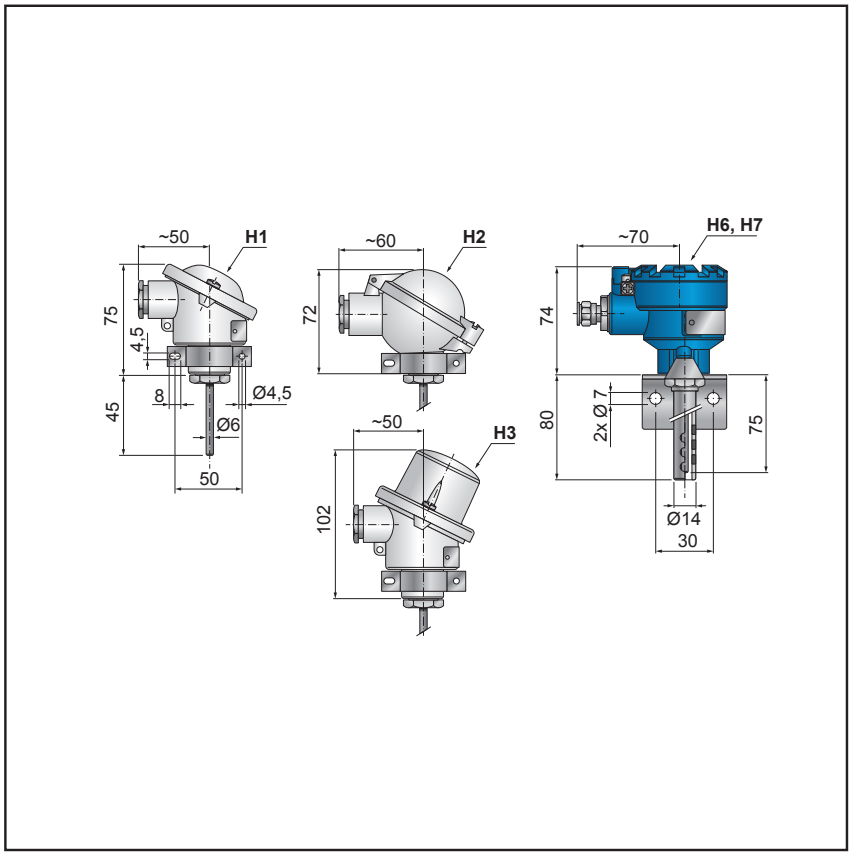
MANUAL

T1010

Spatial Resistance Temperature Sensors without/with Transmitter



- **Measuring resistor 1x / 2x Pt100, Pt500, Pt1000**
- **Measuring range -50 to +150 °C**
- **Accuracy class A, B according to EN 60751**
- **Head form B according to DIN (Al alloy or stainless steel)**
- **Housing IP 65, IP 68**
- **Optional headmounted transmitter with output 4 to 20 mA, HART, Profibus, Fieldbus, including version with galvanic isolation and intrinsically safe version**
- **Flameproof enclosure Ex II 2G Ex d IIC T5/T6 Gb**
- **Protection by enclosure Ex II 2D Ex tb IIIC T90°C Db**

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Contents

1. General instructions and information

1.1 Symbols used


Symbol of warning; for safe use it is necessary to proceed according to the instructions


Symbol CE certifies compliance of the product with the respective government directives


This product does not belong to public waste and it is subjected to separate collection


The product meets requirements for explosion hazard environment according to the further specification

1.2 Safety warnings and cautions


The equipment may be installed only by a qualified personnel who are familiar with national and international laws, directives, standards and with the instructions manual. The equipment shall be supplied from a safe voltage source that meets all requirements of the standard EN 61010-1 and must be-installed in compliance with national requirements and standards providing safety.
The instrument may not be used for other purposes than as specified in this instruction manual. When used with headmounted transmitter, observe also the requirements according to transmitter manual. For elimination of a risk of injury from electric shock or fire, the maximum operational parameters of the instrument may not be exceeded.

1.3 Scope of delivery

With the product is delivered:

- Manual for installation, operation and maintenance
- Certificate of calibration (only with calibrated sensors)
- Copy of EC certificate on type examination ATEX (only sensors for explosion hazard environment)

1.4 Description of the delivery and packing

The product is packaged in a protective cover and provided with an identification label with a mark of the output control.

The product must not be exposed to direct rain, vibrations and shocks during transport.

1.5 Storage

The products shall be stored at temperatures from 5 °C to 35 °C and maximum relative humidity 80% in the rooms with elimination of condensation of water vapours on the products. The stored products shall not be exposed to any shocks, vibrations and effects of harmful vapours and gases.

1.6 Installation and commissioning

During installation, commissioning, operation and maintenance follow the instructions in chapter 4.

1.7 Spare parts

Any of the compact parts of the product can be also ordered as a spare part if there are not required special procedures or technological operations for the exchange. In case of exchange of the measuring sensor or transmitter, it is necessary to perform a calibration in the calibration laboratory of the manufacturer after exchange.

1.8 Repairs

Products are repaired by the manufacturer. The products for repair should be sent in a packing that guarantees damping of shocks and vibrations and protects against damage during transport.

1.9 Warranty

Products are covered by a warranty for a period of 24 months from the delivery date on the delivery note. The manufacturer guarantees technical and operational parameters of the products within scope of the applicable documentation. Warranty period is specified with individual items and begins from the day of takeover of the goods by the purchaser or delivery to the carrier. Any claims concerning to defects of the goods together can be filed in writing with the manufacturer within the warranty period and the claimed product shall be presented. The claiming party shall give identification of the product, number of the delivery note and description of the fault or defect.

The manufacturer is not responsible for any defects caused by improper storage, incorrect connection, damages caused by external effects, in particular by effects of factors with excessive values, unqualified installation, improper operation or common wearing.

2. End of service and disposal

2.1 End of service


In case that sensor with flameproof enclosure (code ED) or protection by enclosure (ET) version is under voltage, the sensor shall not be dismounted, cover of the head shall not be opened and the cable outlet shall not be released!

At the end of the sensors operation, particularly sensors in explosion proof version (code ED) or protection by enclosure (code ET), dismounting of the sensors may be carried out after their disconnection from the power supply voltage.

General

Before removing and ending of service of the sensor is at first necessary to switch the control loop to manual operation, or take other appropriate action to prevent potential harm associated with the end of sensor operation. Connected power supply is switched off, the head is opened and connecting wires of the sensor are disconnected (cut off).

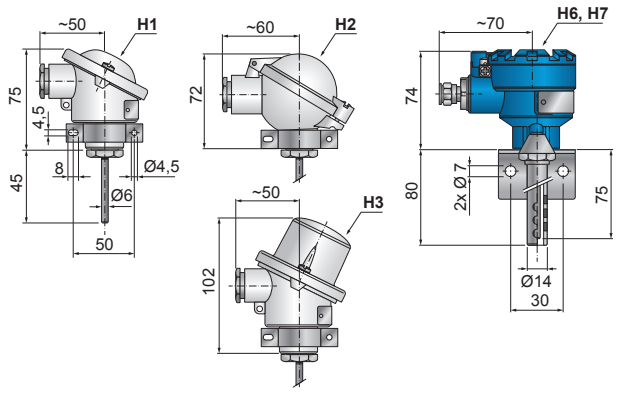
2.2 Disposal


The products do not contain any environmentally hazardous parts. When disposing the packing and destroyed or irreparably damaged product proceed according to the local regulations.

3. Product description

T1010
Spatial Resistance Temperature Sensors without/with Transmitter

- **Measuring resistor 1x / 2x Pt100, Pt500, Pt1000**
- **Measuring range -50 to +150 °C**
- **Accuracy class A, B according to EN 60751**
- **Head form B according to DIN (Al alloy or stainless steel)**
- **Housing IP 65, IP 68**
- **Optional headmounted transmitter with output 4 to 20 mA, HART, Profibus, Fieldbus, including version with galvanic isolation and intrinsically safe version**
- **Flameproof enclosure Ⓔx II 2G Ex d IIC T5/T6 Gb**
- **Protection by enclosure Ⓔx II 2D Ex tb IIIC T90°C Db**



3.1 Application

Spatial resistance temperature sensors T1010 are intended for remote ambient temperature measurement (ambient air). Sensors with head H6 or H7 in version for explosion hazard environment of gasses (flameproof enclosure, code ED) and for explosion hazard environment of dusts (protection by enclosure, code ET) can be installed in zone 1, 2, 21, 22 according to EN 60079-10. Sensors can be supplied with connecting terminal or with transmitter mounted in the sensor head.

3.2 Description

A sensor of the thermometer is made of one or two measuring resistors, embedded in the stem of exchangeable measuring insert. Resistors are connected by inner wiring to the terminal block in the sensor head. There is used defined resistance change according to temperature change. At sensors with transmitter is resistance signal further transformed to linearized unified current signal 4 to 20 mA, optionally to HART, Profibus, Fieldbus output. Sensors are mounted by auxiliary head holder on wall in rooms, construction halls, sports halls etc.

4. Installation, operation and maintenance

4.1 Installation and commissioning

4.1.1 General

Sensor is fixed on wall or construction by auxiliary head holder.

Sensor without installed transmitter is connected to the decoding devices using copper connection cable wires with cross section 0.5 to 1.5 mm^2.

Connection terminal is accessible after removal of the head cover. Drawing of the connection terminals and wiring are shown on the scheme of electrical connection. The sensor outlet shall be carefully sealed after connection of the wires.

4.1.2 Commissioning

Temperature sensor without transmitter in the head is ready for operation after connection of copper connection wires between the sensor terminals and terminals of the associated apparatus and after mounting head cover.

Temperature sensor with transmitter in the head (installed in the head cover) is ready for operation if terminals of the measuring insert and transmitter are connected by the attached connection wires and after connection of copper connection wires between the sensor terminals and terminals of the associated apparatus and after mounting head cover.

Temperature sensor with transmitter in the head (installed on the measuring insert flange instead of a ceramic terminal) is ready for operation after connection of copper connection wires between the sensor terminals and terminals of the associated apparatus and after mounting head cover.

⚠ Sensor with flameproof enclosure (code ED) and protection by enclosure (code ET) may be put into operation after tightening the cover of the head and cable glands.

4.1.3. Installation of the sensors into into explosion hazard environment acc. to EN 60079-0, EN 60079-1, EN 60079-10 and EN 60079-31

Sensor version:

- code ED: Flameproof enclosure Ex d

- code ET: Protection by enclosure Ex t

⚠ Any intervention into construction of the sensor with a ED, ET or EI version is not permitted and may cause an explosion!

Temperature sensors in version ED/ET can be installed in zone 1, 2, 21, 22 according to EN 60079-10.

The sensors for explosion hazard environment shall be used only in the environment and mediums that their properties (abrasion, chemical corrosiveness, vibrations, etc.) do not damage fitting of the sensor.

In addition to specified cable glands, it is possible to use for the sensors also other cable glands with connection thread M20x1.5 and with individual approval for specific type of protection. Cable gland must meet the requirements of EN 60079-1.

When using cable glands (code KME1, KME2) designed for fixed cable installation, the cable shall be fixed against a possible rotation and displacements. Cable gland provides proper protection if it is correctly tight and used with sealing.

Used cable must have a circular cross section and eventually it is not allowed to banding it to change its diameter.

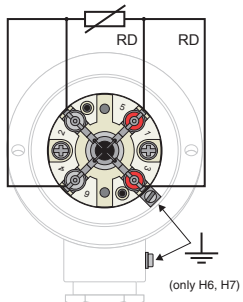
User is obliged to ensure installation of temperature sensor in ED, ET version in such a way, that there is no influence of external heat sources (measured medium, sun heating, etc.) on the surface of the sensor and its fittings that could lead to exceeding defined maximum surface temperature.

Sensor with flameproof enclosure (code ED) shall be installed in such way, that the distance between flameproof enclosure (threaded gap of head cover) and ambient walls, constructions or other solid barriers is at least 40 mm. The head cover (H6, H7) must be tightened, that dimension of gap between the head cover and head body is maximally 0,2 mm! Ambient temperature of head must be in the range of -50 to +85 °C, -50 to +75 °C for temperature class T6.

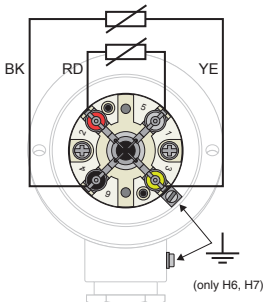
4.1.4 Electrical connection

RD - red
BK - black
YE - yellow
⏚ - ground clamps

1xPt100, 1xPt500, 1xPt1000/4-wire



2xPt100, 2xPt500, 2xPt1000/2-wire



4.2 Operation and maintenance

The product does not need any operation or maintenance.

It is recommended to check the mounting of the sensor at preselected intervals.

To ensure metrological parameters of the sensors, periodic checks of calibration parameters must be performed. Period of calibrations is set by the user and it is based on operating conditions and internal metrology regulations. Manufacturer's recommended period is 12 months. If there is during the calibration found difference from the expected metrological parameters, it is necessary to replace the measuring insert.

⚠ In case that the sensor with flameproof enclosure (code ED) or protection by enclosure (code ET) version is under voltage, the sensor shall not be dismounted, cover of the head shall not be opened and the cable outlet shall not be released! Any intervention into construction of the sensor with a explosion proof version is not permitted and may cause an explosion!

5. Product specifications

5.1 Technical specifications

Measuring resistor:
1xPt100, 1xPt500, 1xPt1000 accuracy class A, B according to EN 60751, inside wiring: four-wire
2xPt100, 2xPt500, 2xPt1000 accuracy class B according to EN 60751, inside wiring: two-wire

Measuring range:
-40 to +150 °C
-50 to +85 °C in flameproof enclosure version (code ED) or in protection by enclosure version (code ET)

Measuring current:
up to 2 mA (Pt100) [1)]
up to 0.5 mA (Pt500, Pt1000) [1)]
recommended ≤ 1 mA (code ED)
maximal 3 mA (code ED)

Output signal:
without transmitter resistance
with transmitter linearized 4 to 20 mA
other after agreement

Dielectric strength:
500 V eff

Electrical insulation resistance:
min. 100 MΩ according to EN 60751,
at temperature (25 ±10)°C, max. 80 % relative humidity

Materials:
head
- aluminium alloy (code H1, H2, H3, H6)
- stainless steel 1.4541 (AISI 321) (code H7)

stem
- stainless steel 1.4541 (AISI 321)

holder
- varnished carbon steel (P1, P2)
- stainless steel 1.4541 (AISI 321) (P3 - ED/ET version)

inside wiring
- Cu

Housing (according to EN 60529):
IP 65, IP 68 (according to used head)

[1)] ... only for sensor without transmitter

5.2 Operation conditions

Maximal temperature of head H1, H2, H3 (not for Ex version):
150 °C (without transmitter)
85 °C (with transmitter P5310, P5311 and 5335)

Ambient temperature Ta of head H6, H7 for Ex version (code ED, ET):

-50 ≤ Ta ≤ 85 °C temperature class T5
-50 ≤ Ta ≤ 75 °C temperature class T6

Maximal permissible operating properties of transmitter in the head for Ex (version ED, ET):

I_{imax}: 30 mA
P_{imax}: 1 W

5.3 Supplementary parameters

Weight:

a) without transmitter with head H1: 0.25 kg

b) with head H2 plus 0.04 kg
H3 plus 0.05 kg
H6 plus 0.16 kg
H7 plus 0.70 kg

c) with transmitter P5310 plus 0.04 kg
P5311 plus 0.05 kg
5335 plus 0.05 kg

5.4 Metrological parameters

Temperature sensors can be supplied:
- as sensors with calibration,
- as sensors without calibration.

Tolerance limits of accuracy classes are listed in EN 60751. The initial tolerance is related to the initial calibration of the sensor. Drift of the sensor meets the requirements of EN 60751, Sec. 6.5.3. To ensure accuracy of measurement, it is necessary to calibrate sensors periodically according to the operating parameters. Sensors can be supplied with calibration at several temperature points, according to customer requirements. Sensor to the transmitter can also be supplied with calibration including transmitter with current output signal of 4 to 20 mA.

5.5 Restricting conditions for application in explosion hazard environment

Surface temperature for Ex version (code ED, ET):

User is obliged to ensure installation of temperature sensors in such a way, that there is no influence of external heat sources (measured medium, sun heating, etc.) on the surface of the sensor and its fittings that could lead to exceeding defined maximum surface temperature defined in EN 60079-0. When defining a surface temperature of the sensor, it has to be calculated with a 5 °C for heating of the sensor from possible maximum operating energy output (P_{imax} = 1 W).

Maximal surface temperatures for electrical devices group II for explosion hazard environment of gases, vapors and mists according to EN 60079-14 are listed in the following table. The maximal surface temperature for electrical equipment group II for explosion hazard environment of dusts according to EN 60079-14 is given by the smaller of the values defined in the following points:

a) ignition temperature of dust in layer decreased by 75 °C,

b) 2/3 of ignition temperature of dust in turbulent state.

Temperature class	Maximal surface temperature	Max. temperature of measured medium
T5	100 °C	85 °C
T6	85 °C	80 °C

Maximal surface temperature Tx for dust explosive atmosphere is equal to measured medium temperature Tm.

Tx = Tm

6. Tests, certificates, standards and marking

6.1 Tests and certificates

Temperature sensors have the following certificates and approvals:

EC Certificate on type examination, No. FTZÚ 03 ATEX 0297X with appendix No. 5 dated 7.5.2013.

For explosion hazard environment of gasses are approved these versions (code ED):

Ex II 2G Ex d IIC T5/T6 Gb

For explosion hazard environment of dusts are approved these versions (code ET):

Ex II 2D Ex tb IIIC T90°C Db

Certificate of conformity

6.2 Standards

Electromagnetic compatibility:

EN 61326-1

Sensors into explosion hazard environment:

EN 60079-0, EN 60079-1, EN 60079-10-1, EN 60079-10-2, EN 60079-14, EN 60079-31

6.3 Marking and type tag information

Marking on temperature sensors head
Standard version - aluminium or stainless steel tag (example):

T1010-02 1 075 S21 H6 S1 P3 ED/ET
type number (version number)

1xPT100/B/4	number of sensors, sensor material, value of basic resistance, accuracy class, version of inside wiring
-50...85 °C	temperature range
11030267	serial number
IP 65	housing
Czech Republic	country of origin
JSP	logo of JSP, s.r.o.
www.jsp.cz	webside address

Tag of explosion hazard environment version (code ED, ET)
This tag include in addition to the standard version this extra information:

JSP, s.r.o. Raisova 547 506 01 Jičín Czech Republic	address of manufacturer
2016	year of manufacturer

symbol of warning

FTZÚ 03 ATEX 0297X — number of EC certificate on type examination

Ⓔx II 2G Ex d IIC T5/T6 Gb
Ⓔx II 2D Ex tb IIIC T90°C Db
marking of explosion proof equipment

CE1026 — marking of conformity and number of notification authority, that made approval

The head cover of flameproof enclosure (code ED) and protection by enclosure version (code ET) has also a self-adhesive label with warning:

DO NOT OPEN UNDER VOLTAGE!

7. Ordering information

7.1 Ordering table

	Type	Description	
•	**T1010-1**	**Spatial resistance temperature sensor**	
	Code	**Temperature sensor**	**Accuracy class according to EN 60751**
•	**02 1**	**1xPt100, four-wire inside wiring**	**B**
○	**03 1**	**2xPt100, two-wire inside wiring**	**B**
	05 1	1xPt500, four-wire inside wiring	B
	06 1	2xPt500, two-wire inside wiring	B
○	**08 1**	**1xPt1000, four-wire inside wiring**	**B**
○	**09 1**	**2xPt1000, two-wire inside wiring**	**B**
○	**02 2**	**1xPt100, four-wire inside wiring**	**A**
	05 2	1xPt500, four-wire inside wiring	A
○	**08 2**	**1xPt1000, four-wire inside wiring**	**A**
	Code	**Nominal length L [mm]**	
•	**045**	**45 (only with code H1, H2, H3)**	
	075	75 (only with code H6, H7)	
	Code	**Stem - outer diameter [mm]**	**Stem coat material**
•	**S21**	**Ø 6 mm**	**Stainless steel 1.4541**
	Code	**Head**	
•	**H1**	**Al alloy, with terminal board, for cable diameter 4 to 12.5 mm, IP 65**	
	H2	**Al alloy, with terminal board, for cable diameter 4 to 12.5 mm, IP 65**	
•	**H3**	**Al alloy, with cap for mounting of transmitter Ø 44 mm, with terminal board, for cable diameter 4 to 12.5 mm, IP 65**	
	H6 [1]	Al alloy, for mounting of transmitter Ø 44 mm, without terminal board, ground clamps, thread for cable outlet M20x1.5, IP 68	
	H7 [1]	Stainless steel, for mounting of transmitter Ø 44 mm, without terminal board, ground clamps, thread for cable outlet M20x1.5, IP 68	
	S1 [2]	Terminal board for connection wire (for heads H6, H7 without transmitter)	
	Code	**Process connection**	
•	**P1**	**Thermometer holder for wallmounting (for heads H1, H2, H3)**	
	P3	Stainless thermometer holder for wallmounting (for heads H6, H7)	
		OPTIONAL ACCESSORIES	
	Code	**Versions for explosive atmosphere of gasses or dusts**	
	ED/ET	Explosion proof (Ex) II 2G Ex d IIC T5/T6 Gb, protection by enclosure (Ex) II 2D Ex tb IIIC T90°C Db (only with code H6, H7)	
	Code	**Calibration in customer defined points, including certificate of calibration**	
○	**KTE-P3**	**Spatial resistance temperature sensor calibration in three points in range -40 to +60 °C**	
	KTE-P9	Other	
	Code	**Cable outlet**	
•	**KM1**	**Cable outlet, nickel silver, IP 68, M20x1.5, diameter of cable 5 to 10 mm (for heads H6, H7)**	
•	**KME1**	**Cable outlet, nickel silver, Ex d, M20x1.5, IP 68, for fixed assembly cable with diameter 4.5 to 8.5 mm**	
•	**KME2**	**Cable outlet, nickel silver, Ex d, M20x1.5, IP 68, for fixed assembly cable with diameter 7 to 12 mm**	
	KM9	Other	
•	**PK1**	**Lock anti pull-up cable for Ex d cable outlet KME1**	
•	**PK2**	**Lock anti pull-up cable for Ex d cable outlet KME2**	
	Code	**Transmitters for headmounting**	
•	**P5310 H10**	**Transmitter with LHP protocol (see data sheet No. 0824)**	
○	**P5310EN2 H10**	**Transmitter with LHP protocol, (Ex) II 3G Ex nA IIC T4 Gc (see data sheet No. 0824)**	
•	**P5311 H10**	**Transmitter with LHP protocol with galvanic isolation (see data sheet No. 0824)**	
○	**P5311EN2 H10**	**Transmitter with LHP protocol with galvanic isolation, (Ex) II 3G Ex nA IIC T4 Gc (see data sheet No. 0824)**	
○	**P5311EI1 H10**	**Transmitter with LHP protocol with galvanic isolation, (Ex) II 1G Ex ia IIC T4-T6 Ga, (Ex) II 1D Ex ia IIIC T106°C Da (see data sheet No. 0824)**	
•	**5335A**	**Transmitter with HART protocol with galvanic isolation, (Ex) II 3G, (Ex) II 3D (see data sheet No. 0786)**	
•	**5335D**	**Transmitter with HART protocol with galvanic isolation, Ex) II 1G Ex ia IIC T6 or T4 Ga, (Ex) II 1D Ex ia IIIC Da, (Ex) I M1 Ex ia I Ma, CSA and FM (see data sheet No. 0786)**	
Example of order:		**T1010-1 02 1 045 S21 H3 P1 KTE-P3 (-40, 10, 60 °C)**	

• ... Ex stock version ° ... Marked version can be dispatched up to 5 working days (with calibration up to two weeks)

[1] … Temperature transmitter is mounted directly on flange of measuring insert instead of ceramic terminal block when temperature sensor is supplied with head H6 or H7.

[2] … Only for sensor without transmitter.

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